THE TWENTIETH part of ENGLER'S *Das Pflanzenreich* is a presentation of the great tropical family Zingiberaceae by SCHUMANN.[13] The usual critical discussion of the family from various standpoints is followed by a presentation of the 38 genera and 849 species. Four new genera (*Odontychium*, *Gagnepainia*, *Aframomum*, *Monocostus*) and 141 new species are described.—J. M. C.

ROTH'S *Europäischen Laubmoose*[14] progresses rapidly, the eighth part having been issued in July and the ninth in October. They contain the conclusion of the Acrocarpae and a good share of the Pleurocarpae. It would seem that two more parts might complete the work. The author would do well to devote a final part to keys to genera and species.—C. R. B.

THE SECOND fascicle of the third volume of HALÁCSY'S[15] flora of Greece completes the work, including from Gramineae through the pteridophytes. With this last fascicle appear the general preface, the bibliography, an introduction describing the floristic regions, and a good index.—J. M. C.

NOTES FOR STUDENTS.

BESSEY[16] has described the peculiar stomata of *Holacantha Emoryi*, a leafless shrub of the southwestern arid regions. The guard cells lie at the bottom of a narrow chimney-shaped cavity which extends above and below the epidermis, and consists of about eight vertical rows of cells.—J. M. C.

THE MORPHOLOGY and general histology of three Pacific coast algae are described in the last number of the Minnesota Botanical Studies:[17] *Callymenia phyllophora* by CLARA K. LEAVITT; *Endocladia muricata* by FLORENCE M. WARNER; and *Laminaria bullata* by OLGA MUELLER.—B. M. DAVIS.

RUSSELL[18] shows many photographic prints produced by contact or mere approximation of various woods with a sensitized plate in darkness. The amount of action varies greatly with different woods, exposures of thirty minutes to eighteen hours or more being required. The active agent seems to be H_2O_2, and probably the resin in the wood is the indirect cause.—C. R. B.

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[13] ENGLER, A., Das Pflanzenreich. Heft 20. Zingiberaceae von K. SCHUMANN. pp. 458. Leipzig: Wilhelm Engelmann. 1904. *M* 23.

[14] ROTH, GEORG, Die europäischen Laubmoose. Leiferung 8, pp. 257–384. *pls. 21–30*. Leiferung 9, pp. 385–512. *pls.* 31–40. Leipzig: Wilhelm Engelmann. 1904. Each *M* 4. Not sold separately.

[15] HALÁCSY, E. de, Conspectus Florae Graecae. Vol. III. fasc. 2. pp. 321–520. Leipzig: Wilhelm Engelmann. 1904. *M* 6.

[16] BESSEY, CHARLES E., The chimney-shaped stomata of *Holacantha Emoryi*. Bull. Torr. Bot. Club **31**:523–527. *pl. 24*. 1904.

[17] Minnesota Botanical Studies **3**:291–308. *pls. 44–47*. 1904.

[18] RUSSELL, W. J., On the action of wood on a photographic plate in the dark. Phil. Trans. Roy. Soc. London B. **197**:281–289. *pls. 11–18*. 1904.

SCHULZE[19] has investigated quantitatively the formation of arginin in various stages of the germination of *Lupinus luteus*. He finds it is produced entirely from proteid decomposition, probably through the action of erepsin, a protease. The facts adduced seem to support his contention that asparagin is a secondary product, because it is not formed *pari passu* with decomposition of proteids as arginin is.—C. R. B.

MOLISCH reports[20] an extraordinarily rapid autonomous movement of the leaves in *Oxalis hedysaroides* HBK., far exceeding the oft-described movements of *Desmodium gyrans*. In the latter the leaf completes its elliptical path in 85–90 seconds at a temperature of 35° C., while in the former the tips of the leaflets may sink at once 30–45°, or a distance of 5–15^{mm}, in a single second, though the movement may consume twelve seconds and be executed in a succession of six jerks, with a pause of about a second between. The recovery occupies about five minutes.—C. R. B.

THE RESULTS of SCHOUTE[21] on the histogenetic layers of *Hippuris vulgaris* have been called in question by KNIEP[22] who considers that SCHOUTE studied too few specimens and used unsuitable methods. From a renewed study of the growing point in a large number of stems of Hippuris, KNIEP concludes that the histogenetic layers of HANSTEIN correspond to the regions distinguished by VAN TIEGHEM, thus going back to the old accepted view. It is unfortunate for this theory that Hippuris is the only flowering plant in which the histogenetic layers of the stem are distinguishable.—M. A. CHRYSLER.

SCHIFFNER calls COKER sharply to account[23] for overlooking his characterization of Dumortiera as having rudimentary air-chambers and so misrepresenting him.[24] He contends that the obliteration of the air-chambers is not an adaptation to a moist habitat, as COKER suggested, nor dependent on exposure to light, as STEPHANI held. Observations in Java and the constancy of *D. trichocephala* and *D. velutina* under cultivation for twenty years in the Vienna botanic garden are adduced in favor of his view that the extent of development of the air-chambers is a fixed and hereditable character of each species.—C. R. B.

THE JOINTED structure peculiar to some genera of the corallines in the red algae has been studied by YENDO.[25] These regions of the plant are free from

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[19] SCHULZE, E., Ueber die Argininbildung in den Keimpflanzen von *Lupinus luteus*. Ber. Deutsch. Bot. Gesells. **22**:381–384. 1904.

[20] MOLISCH, HANS, Ueber eine auffallend rasche autonome Blattbewegung bei *Oxalis hedysaroides* HBK. Ber. Deutsch. Bot. Gesells. **22**:372–376. *figs. 2.* 1904.

[21] See review in BOT. GAZ. **35**:144. 1903.

[22] KNIEP, H. Sur le point végétatif de la tige de l'*Hippuris vulgaris*. Ann. Sci. Nat. Bot. VIII. **19**:293–303. 1904.

[23] SCHIFFNER, V., Ueber Dumortiera. Hedwigia **43**:428. 1904.

[24] COKER, W. C., Dumortiera. BOT. GAZETTE **36**:225. 1903.

[25] YENDO, K., A study of the genicula of Corallinae. Jour. Coll. Sci. Imp. Univ. Tokyo **19**:—. [pp. 41. *pls. 1.*] 1904.

the lime which is deposited between the cells in all of the nodes. The form of the genicula are frequently of important taxonomic value and they present several types of structure, the pitted structure being described and figured. The pits are both lateral and terminal and consist of depressions which extend to the middle lamella where there is a lens-shaped thickening which, however, lies in the middle of the cavity and does not completely close the pit.—B. M. DAVIS.

MISS FORD[26] has published a somewhat detailed account of the anatomy of Psilotum. The plant is monostelic throughout, being protostelic at the base of the aerial stem and often siphonostelic above. In the aerial branches a central core of sclerenchymatous fibers is found, and throughout the phloem is poorly developed. The form is probably a reduced one, but the anatomical evidence does not relate it closely to any of the living Lycopodiales. There is closer resemblance to certain Lepidodendron forms; but the combination of sporangial and anatomical characters is closest to Sphenophyllales, as BOWER has suggested.—J. M. C.

THE DEVELOPMENT of sieve tissue in conifers has been studied by CHAUVEAUD,[27] who describes elements intermediate between sieve tubes and parenchyma occurring in the hypocotyledonary portions of *Abies Pinsapo*, though not found in the higher regions of the stem. These elements are succeeded by the primary phloem, and both are eventually squeezed to a flat mass by growth of the secondary phloem. In another paper[28] the same author shows that the double leaf trace in the genera Abies and Pinus is single in the leaf of the seedling, and in the course of ontogeny splits into two, that is the double leaf trace is a secondary formation.—M. A. CHRYSLER.

DENNISTON[29] finds in developing starch grains of various sorts an outer sharply defined layer of material next the plastid which takes up orange strongly from the safranin gentian-violet orange stain, while the body of the grain becomes bright violet. Grains partly digested by diastase show the orange-staining layer little affected, while the violet regions are much dissolved and orange-staining material appears in the corroded interior. DENNISTON interprets these reactions to mean that the outer layer is different from the rest (MEYER was able only in a few cases to find such a layer in potato starch) and, in harmony with TIMBERLAKE'S study of the developing cell wall, believes it to be a carbohydrate not yet fully polymerized to starch.—C. R. B.

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[26] FORD, SIBILLE O., The anatomy of *Psilotum triquetrum*. Ann. Botany **18**: 589–605. *pl. 39*. 1904.

[27] CHAUVEAUD, G. Le liber précurseur dans le sapin pinsapo. Ann. Sci. Nat. Bot. VIII. **19**:321–333. 1904.

[28] CHAUVEAUD, G. Origine secondaire du double faisceau foliare chez les sapins (Abies) et les pins (Pinus). *l. c.* 335–348.

[29] DENNISTON, R. H., The structure of the starch grain. Trans. Wis. Acad. **14**: 527–533. 1904.

FROM A series of experiments in which the radicles of seedlings were employed as physiological reagents, DANDENO[30] concludes that the theory of electrolytic dissociation is without support from the physiological side. The author also finds, as TRUE and OGLEVEE have already shown,[31] that the toxic effect of certain solutions is greatly reduced by the mere presence of non-chemical bodies, such as pure sand whose property of physical affinity retards chemical action and physiological effect. The economic significance of these facts is also stated. Other factors regarded as affecting toxicity of solution are quantity of solution, rate of diffusion, shape of container, and even the glass walls of the container. —RAYMOND H. POND.

TWO NOTES of interest in relation to the way in which the powdery mildew and downy mildew live through the winter are published by ISTVÁNFFI.[32] As is well known the perithecia of the powdery mildew rarely occur in Europe, and according to the author they have not been found in Hungary. Patches of mycelium, however, are said to remain alive during the winter on the stems and dried clusters of grapes left on the vines. From these fresh conidia were produced when taken into the laboratory in January. Similar observations, the author states were made by APPEL. The mycelium of the downy mildew is also found[33] to survive the winter in parts of the vine, especially in the buds, thus confirming the observations of CULONI.—H. HASSELBRING.

TO ASCERTAIN the influence of a periodical dry season upon the meristematic activity of the cambium, URSPRUNG[34] has studied the anatomy of certain species common to Buitenzorg and East Java. The climate of the former locality is uniform, while that of the latter shows a distinct periodicity of wet and dry seasons. He finds as a general rule (for representatives of six different families) that material from East Java shows a much more complete and distinct zonation of wood structure than specimens of the same species from Buitenzorg. Species vary, however, in susceptibility to climate, since the one which shows the relatively clearest zonation in Buitenzorg may not sustain this relation in a group of the same species from East Java. The influence of foliation and defoliation upon

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[30] DANDENO, J. B., The relation of mass action and physical affinity to toxicity, with incidental discussion as to how far electrolytic dissociation may be involved. Amer. Jour. Sci. IV. **17**:437–358. 1904.

[31] TRUE, R. H., and OGLEVEE, C. S., The effect of the presence of insoluble substances on the toxic action of poisons. Science N. S. **19**:421. 1904.

[32] ISTVÁNFFI, GY. DE, Sur l'hivernage de l'oïdium de la vigne. Compt. Rend. Acad. Sci. Paris **138**:596–597. 1904.

[33] ISTVÁNFFI, GY. DE, Sur la perpétuation du mildiou de la vigne. Compt. Rend. Acad. Sci. Paris **138**:643–644 1904.

[34] URSPRUNG, A., Zur Periodicität des Dickenwachsthums in den Tropen. Bot. Zeitung **62**[1]:189–210. 1904.

the activity of the cambium is given some attention, but no general conclusion is established.—RAYMOND H. POND

SEVERAL METHODS in cytological technique are described by OSTERHOUT.[35] One of these is a substitute for the universally used paraffin method. Though various soaps have been tried and found unsatisfactory, OSTERHOUT has developed a method with cocoanut oil soap which he regards as superior to the paraffin method. It is better to make one's own soap, using 70^{cc} of cocoanut oil to 38.5^{cc} of 28 per cent. solution of caustic soda in water. The tissue is placed in warm water and the soap added gradually until a fairly strong solution is obtained. It may then stand in the bath for two or three days. When sufficiently firm, the block may be cut. The sections form a perfect ribbon and do not crumble or crush as is so often the case with paraffin. They may be fixed to the slide with albumen. In trying this method one should have the full paper at hand.—CHARLES J. CHAMBERLAIN.

THE GREAT and, indeed, almost violent interest taken in some quarters in Bulletin 22 of the U. S. Bureau of Soils, will cause the appearance of Bulletin 23 to arouse some curiosity at least.[36] The subject-matter of the present bulletin falls into two separate portions. The first presents a series of rather incomplete experiments on the movement of soil water, together with some data on the rate of imbibition of seeds in contact with moist soil, while the second portion deals with experiments on the growth of plants in culture media. The first mass of material is not important, but the second presents a discovery which, if substantiated and generally true, is as far-reaching and important as it is unexpected. This discovery is, briefly, that the good or bad characteristics of a soil are transmitted to its aqueous extract. This is shown by growing wheat plants in pots of the soils to be compared and in bottles of watery extract of these same soils. In such an experiment the different water cultures show the same relations as do the pot cultures. The plants were compared in respect to size and general appearance and to amount of transpiration. That this difference in soils and their solutions is not one of mineral salts is shown by the fact that good and poor Cecil clay show the difference markedly, although practically identical in chemical nature. It is suggested that the bad properties of at least some sterile soils may be due to organic substances. The bulletin is essentially a report of progress and all of its lines of investigation will need further work before they can be regarded as established.—B. E. LIVINGSTON.

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35 OSTERHOUT, W. J. V., Contributions to cytological technique. (1) A simple freezing-microtome. (2) Fixation *in vacuo*. (3) A simple slide holder. (4) A rapid method of mounting in aqueous media. (5) Embedding microscopic algae. (6) Embedding with incomplete dehydration. Univ. of California Publications. Botany **2**:73–90. 1904.

36 WHITNEY, M. and CAMERON, F. K., Investigations in soil fertility. U. S. Dept. Agric., Bureau of Soils, Bull. 23. 1904.

MISS MATTHAEI[37] has made a careful study of the effect of temperature on photosynthesis, which by avoiding radical sources of error corrects the resul s of various observers and particularly those of KREUSSLER, which have been accepted and quoted for more than a decade. Having found that the actual temperature of a leaf was not that of the water bath within which it was placed when high intensity of light was used, thermoelectric measurements of temperature became necessary. A thermocouple of copper and constantan wires only .087 mm in diameter was imbedded in the midrib of the leaf used and was connected with a galvanometer to which also a second thermoelement in a water bath was connected. When this bath was brought to such a temperature that there was no deflection of the needle the temperature of the element in the leaf was known. The results show that corresponding to each temperature there is a definite maximal amount of photosynthesis which cannot be reached unless both light and CO_2 supply are adequate. These maxima increase with increasing temperature, forming a curve convex to the temperature abscissas which resembles the respiration-temperature curve. They begin to decrease suddenly some degrees below the temperature which can be endured only a few hours. The maximum photosynthesis at any temperature can be maintained only for a short time, declining the sooner the higher the temperature. The difficulties overcome in the experimentation and the manipulative skill exhibited make this a notable contribution to plant physiology.—C. R. B.

KUYPER[38] has given an account of the events of the development of the ascocarp of *Monascus purpureus* Went and *M. Barkeri* Dangeard. The account of the former agrees in the main with that recently given by IKENO,[39] but differs in some respects. The sequence of events is as follows: The ascogonium consists of two cells, the lower of which develops. No fusion was observed between the ascogonium and pollinodium. The number of nuclei in the ascogonium increases. "Free cells" are then formed possessing one to several nuclei. The 1-nucleate stage is regarded as having arisen from the fusion of the nuclei of the originally binucleate cell, a view opposed to that of IKENO, who believes the cells to appear with single nuclei. In the next stages the number of nuclei in each free cell increases to a considerable extent. It appears that the spores are now formed within the free cells. These are represented as containing a variable number of nuclei, one to many, so that the whole spore is deeply stained. According to IKENO each spore contains but a single nucleus while the other nuclei of the free cell degenerate. When mature the spores fall apart and come to lie free in the

[37] MATTHAEI, GABRIELLE L. C., Experimental researches on vegetable assimilation and respiration. III. On the effect of temperature on carbon-dioxide assimilation Phil. Trans. Roy. Soc. London B. **197**:47–105. *figs. 6.* 1904.

[38] KUYPER, H. P., De perithecium-ontwikkelung van *Monascus purpureus* Went en *M. Barkeri* Dangeard in verband neet de phylogenie der Ascomyceten. Dissertation. pp. 148. Amsterdam. 1904.

[39] IKENO, Ueber Sporenbildung etc. Ber. Deutsch. Bot. Gesells. **21**:259. 1903.

ascogonium. The account of *M. Barkeri* follows the same general outline with some differences as to details. The protoplasm of the ascogonium is divided into sections by irregular vacuoles. These sections become free cells within which the spores are formed. In the summary one spore is said to be formed from each of the eight nuclei in the free cell; in the text, however, the spores are described as possessing many nuclei. The paper contains also a long discussion of the Hemiasci and the phylogeny of the ascomycetes.—H. HASSELBRING.

NATHANSOHN[40] continues his investigations of the nature and functions of the plasmatic membrane in plants. The following points are now announced. If slices of Dahlia tubers be placed in 2 per cent. $Na_2S_2O_3$ solution for two days, they absorb the salt to such an extent that at the end of the experiment its concentration within the tissues is about one-sixth of that without. If now these slices be changed to a solution of the same salt of a concentration equal to that now within the tissue, there occurs a marked outward diffusion, so that at the end of another two days the inner concentration is considerably less than one-half of the outer one. This means, of course, that the salt has passed through the plasmatic membrane in a direction from the weaker to the stronger solution, *i. e.*, against its own diffusion tension. This case substantiates similar results already published by the same author.

Furthermore, slices of the tubers of *Helianthus tuberosus* and of the roots of the red beet placed in solutions of NH_4Cl, NH_4NO_3, $(NH_4)_2S_2O_3$, $(NH_4)_2SO_4$, and $(NH_4)_2HPO_4$, absorb much more of the ammonium ion than of the anion. This is not accompanied by an increasingly acid reaction of the external solution. The last observation led to an investigation of the substances which might diffuse out from the cells, and enough Mg was found to have escaped to account for about three-fourths of the NH_4 which had entered. The author supposes that some other cations, perhaps in part organic bases, must be given out from the cells, and thus explains the lack of acidity. It is possible also to cause the extrusion of Mg by subjecting these tissues to a solution of a potassium salt. K is absorbed and Mg replaces it in the external solution.

A very interesting theoretical discussion makes up a good part of the paper, in which the nature of the protoplasmic layers is considered in the light of the new facts, but this cannot be entered into here.—B. E. LIVINGSTON.

BRIGGS and MCCALL[41] have devised an ingenious method for investigating soil solutions and the rate of movement of such solutions in the soil. The apparatus consists, briefly, of a porous porcelain filter tube connected with a vacuum chamber. The wall of the tube is saturated with water, and in this condition it can be exhausted to the vapor pressure of water, and will maintain this nearly

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[40] NATHANSOHN, A., Weitere Mitteilungen über die Regulation der Stoffaufnahme. Jahrb. Wiss. Bot. **40**:403–442. 1904.

[41] BRIGGS, L. J. and MCCALL, A. G., An artificial root for inducing capillary movement of soil moisture. Science N. S. **20**:566–568. 1904.

complete vacuum against atmospheric pressure for a day or more. The tube thus prepared and connected to a two-liter vacuum chamber is placed in the soil to be studied. The water surfaces of the pores in the tube become continuous with the surfaces of water films in the soil, and water moves into the tube at a rate which varies with the nature of the soil and its amount of contained moisture. The force involved in the movement of water through the wall of the tube is the difference between the capillary pressure or surface tension of the water surfaces at the external and internal ends of the pores of the wall. And since the external surfaces are continuous with those of the soil water, it follows that water must pass from the soil into the tube, for the soil films are subjected to a pressure of one atmosphere, while those at the internal surface of the tube bear a pressure only equal to the vapor pressure of water. The authors do not make this matter immediately clear, and it may simplify matters to call attention to the fact[42] that the films of tube and soil form a system one extremity of which (in contact with the vacuum) is subjected to a very low pressure, while the other extremity (in contact with the air) is subjected to a pressure relatively very great. Thus in the end the solution is driven through the tube by atmospheric pressure, though the steps in the movement involve the forces of capillary films.

The rate at which water collects in the tube is the criterion for the soil's power of delivery. The authors state that the nature of the collected solution is the same as that of the soil itself, though proof of this is reserved for a later paper.—B. E. LIVINGSTON.

ERIKSSON[43] has published two further accounts bearing on the mycoplasma theory of rust fungi. These accounts deal with *Puccinia dispersa* Eriks. on rye and *P. glumarum* Eriks. & Henn. on barley. The facts, according to the author, are these. The teleutospores of *P. glumarum* are capable of germinating immediately after ripening in midsummer. Aecidia occur on *Anchusa arvensis* and *A. officinalis*. During thirteen years' observations the aecidia were observed only in three instances in the vicinity of Stockholm. Both because the aecidium is produced from the teleutospores in summer or autumn, and on account of its rare occurrence in this region, it cannot be the source of spring infections of rye. It is also impossible to find living mycelium in the plants during the winter. These facts point to the conclusion that the infection arises from a germ already existing in the seed. In the leaves sectioned during the winter the author found peculiar dense protoplasm which he considers as a mixture of the protoplasm of the host and of the fungus mycoplasm. Later the nucleus is partially dissolved, while "nucleoli" begin to appear in the mycoplasm. This stage occurs immediately

[42] This method of statement has been hinted at in a review of this article by KING. Either this reviewer has failed to grasp entirely the meaning of the authors or his own statements are so ambiguous as not to warrant a discussion of his criticisms here. See KING, F. H., An artificial root for inducing capillary movement of soil moisture. Science N. S. **20**:680–681. 1904.

[43] ERIKSSON, J., Ueber das vegetative Leben der Getreiderostpilze. Kungl. Svensk. Vet.-Akad. Handl. **38**:—. [no. 3. pp. 18.] *pls.* 3. 1904.

before the appearance of uredosori. In the next stage intercellular protomycelium begins to appear. The patches of mycelium are connected with the "nucleoli" mentioned above. These are the centers of development for the intercellular mycelium. The course of development of *P. glumarum* follows the same lines.

Some of the author's figures admit of a different interpretation from that given. It is difficult to see how a nucleus being dissolved by a substance diffused throughout the cell as the mycoplasm would be can be cut away on one side in such an abrupt way as figured in *pl. 1*. It would seem possible that the protoplasmic connections extending from nucleoli to the intercellular protoplasm represent haustoria, for, to use the author's own words, they give exactly the same impression as a young haustorium of the Uredineae.—H. HASSELBRING.

THE REGULATION of turgor in molds is again the subject of study, this time by PANTANELLI,[44] working with Aspergillus. The author points out that, since in these organisms the cell walls are normally in a state of tension owing to the pressure within, the method of plasmolysis is not available directly as a measure of turgor pressure. Incipient plasmolysis will occur only after the application of an external pressure which is equal to the normal pressure of the vacuole plus that of the stretched wall. He further shows that the pressure which influences the wall is made up of at least three components: the osmotic pressure of the vacuole, the pressure of swelling of the protoplasm itself (*Quellungskraft*, closely related, if not identical with the pressure of imbibition in organic bodies), and the tension of the surface films. The latter is exerted toward the center of the cell, and is negligible when compared with the other two which are exerted in the opposite direction. An ingenious method for approximating these two outwardly directed forces is used in the work. It is based on measurement of cell shrinkage in plasmolyzing solutions. To control the results obtained by plasmolysis, the method of determining the freezing-point of expressed sap is resorted to.

Cells of this form live but a few days and practically all the cells of a culture die when spores are produced. Thus it is necessary to be sure one works with at least a great majority of living cells. The pressure of swelling decreases with age of the cell, while the osmotic pressure of the sap first rises and later falls, but is always dependent upon the pressure of the nutrient medium. The total turgor pressure of a cell depends in great measure upon conditions of nutrition, rising with increase of sugar in the medium, sinking with lack of oxygen. Other conditions, such as temperature changes, anaesthetics, etc., affect turgor pressure, and the author is convinced that in these changes we have a true response within the protoplasm itself. When the fungus responds to sudden increase in external osmotic pressure, its adjustment takes place at a rate which is related to the velocity of penetration into the protoplasm of the solute used. This leads to the idea that the perception of the osmotic stimulus occurs only when this solute has distributed itself throughout the protoplasm.—B. E. LIVINGSTON.

[44] PANTANELLI, E., Zur Kenntnis der Turgorregulationen bei Schimmelpilzen. Jahrb. Wiss. Bot. **40**:303–367. 1904.